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REPUBLIC OF SOUTH AFRICA

PROVISIONAL

PATENT

SPECIFICATION

Application Number

99/02391

Title

A DISPENSING APPARATUS

Filing Date

29 MARCH 1999

Applicant (s)

ROBERT STUART WHITE

Inventors (s)

ROBERT STUART WHITE

To be completed on or before

29 MARCH 2000

HAHN & HAHN

INTELLECTUAL PROPERTY LAW, PATENTS AND TRADE MARKS

FORM P1

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

APPLICATION FOR A PATENT AND ACKNOWLEDGEMENT OF RECEIPT

[Section 30 (1) - Regulation 22]

Revenue stamps or revenue franking machine impression

Official date stamp

The grant of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate

OFFICIAL APPLICATION NO.
21 | 01 | 992391

(i) APPLICANTS OR AGENT'S REFERENCE

FULL NAME(S) OF APPLICANT(S)

(ii) 71 ROBERT STUART WHITE

ADDRESS(ES) OF APPLICANT(S)

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UNITED KINGDOM

TITLE OF INVENTION

(iv) 54 A DISPENSING APPARATUS

(v) The applicant claims priority as set out on the accompanying form P2.
The earliest priority claimed is

(vi) This application is for a patent of addition to Patent Application No. 21 | 01 |

(vii) This application is a fresh application in terms of section 37 and is based on Patent Application No. 21 | 01 |

(viii) This application is accompanied by:

X	1.	A single copy of a provisional ~~specification~~ specification of 13 pages.
X	2.	Drawings of 8 sheets.
	3.	Publication particulars and abstract (form P8 in duplicate).
	4.	A copy of Figure ..... of the drawings for the abstract.
	5.	An assignment of invention.
	6.	Certified priority document(s) (state number):
	7.	Translation of the priority document(s).
	8.	An assignment of priority rights.
	9.	A copy of the form P2 and the specification of S.A Patent Application No. 21 | 01 |
	10.	A declaration and power of attorney form P3.
	11.	Request for ante-dating on form P4.
	12.	Request for classification on form P9.
X	13.	Form P2 + copy

(ix) 74 Address for service: HAHN & HAHN, 222 Richard Street, HATFIELD, 0083, Pretoria

Dated this 29 day of March 19 99

A. J. S. DUNLOP
Signature of applicant(s) or agent

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FORM P6

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

PROVISIONAL SPECIFICATION

[Section 30 (1) - Regulation 27]

OFFICIAL APPLICATION NO.	LODGING DATE
21 ; 01	22 29.03.99

FULL NAME(S) OF APPLICANT(S)

71

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TITLE OF INVENTION

54

A DISPENSING APPARATUS

THIS INVENTION relates to a dispensing apparatus, to a service kit for replacement of parts of the dispensing apparatus, to a dispensing system, and to a method of regulating flow of at least one flowable substance through a hand-held dispensing apparatus.

Various applications exist in which two or more flowable components intended for use in combination with one another need to be dispensed together for admixture with one another. For example, in the field of two-component spray foams, two flowable components are mixed with one another to form a foam, e.g. polyurethane foam. Polyurethane foam is formed by the reaction of a diisocyanate (as a first component) with a diol, e.g. a polyester, in combination with water or a foaming agent (as a second component). Hand-held dispensing apparatuses, e.g. expanded foam dispensing guns, are frequently employed to deliver the two components from their separate storage containers, to mix them with one another, and then to dispense them. Conventional dispensing guns employ plunger and seat arrangements for regulating flow of the components. These arrangements can become blocked with use, necessitating cleaning and re-seating of the arrangement, which can be difficult.

Accordingly, in a first aspect of the invention there is provided a dispensing apparatus for regulating dispensing of at least one flowable substance, which includes

a body;

at least one resiliently deformable tube mounted on or in the body, through which the substance may flow; and

displaceable pinching means for selectively pinching the tube, thereby selectively to restrict or facilitate flow of the substance through the tube.

Preferably, the apparatus is for regulating dispensing of a plurality of flowable substances or components (typically two), and includes a plurality of resiliently deformable tubes (typically two) for ducting the separate components, the pinching means in these embodiments being selectively displaceable to pinch the tubes.

For convenience, the combination of the pinching means acting upon the tubes is hereinafter referred to as a "peristaltic valve system" in view of similarities between the principle of operation of said combination, and that of conventional peristaltic pumps.

Typically, the tubes are formed from a resiliently deformable polymeric substance, e.g. silicon rubber and are mounted in the body of the apparatus. The tubes may be snugly enclosed within complementarily shaped and dimensioned tubular passages defined through the body of the apparatus, to limit the risk of bursting of the tubes while exposed to highly pressurised dispensed components.

The pinching means of the peristaltic valve system may include a pinching member displaceably mounted on the apparatus and selectively movable to bear upon and thus pinch the tubes. The pinching member may have a curved working face for engagement with the tubes.

Typically, however, the pinching means includes cam means rotatably mounted in the body of the apparatus, and having camming surfaces for bearing upon the tubes upon rotation of the cam means, thereby progressively to pinch the tubes. Thus, the cam means may include a cylindrical barrel rotatably mounted in a complementary cylindrical recess in the body of the apparatus, the barrel having hemi-cylindrical rebated regions for accommodation of the tubes, and the camming surfaces being formed by the basal surfaces of the rebated regions.

In a preferred embodiment of the invention, the cam means is arranged such that when rotating in a direction leading to increased bearing of the camming surfaces upon the tubes (i.e. increased pinching of the tubes), a vector-component of the rotation of the cam means is co-directional with the direction of flow of the flowable components in the tubes, so that internal pressure exerted by the components against the walls of the tubes as they flow through the tubes biases the cam means against the tubes, thereby assisting in sealing of the tubes by progressive pinching thereof.

The cam means is typically connected to lever means, e.g. a trigger, for rotating the cam means, thereby to pivot the camming surfaces away from the tubes to facilitate flow through the tubes. The apparatus may include lock means for checking operation of the lever means and the cam means. The lock means may include selectively disengageable biasing means for biasing the lever means and hence the cam means towards a tube-sealed

configuration in which the tubes are sealed by the pinching of the cam means against the tubes.

The body of the apparatus may be shaped, dimensioned and configured for manual handling. The apparatus may thus be in the form of a "gun" configured for gripping and operation by a single hand of a user, and having a hand-grip. The lock means may include an elongate brace member pivotally mounted on the hand-grip and spring-biased towards engagement with the lever means, for bearing upon the lever means and biasing the cam means towards its tube-sealed configuration.

The dispensing apparatus may be an organic plastics expanded foam dispensing gun. The apparatus may thus have hose connection means configured for connecting the respective tubes of the apparatus to containers holding respective flowable components for the formation of sprayed expanded foams. The components may be those typically used for the formation of polyurethane foams.

The apparatus may include a static mixer. It may further include a mixing nozzle for housing the static mixer, removably mounted on the body of the apparatus. The body of the apparatus may have releasable clip means engageable with complementary recesses in the mixing nozzle, for snap-locking engagement of the body with the nozzle. The nozzle may have an elongate mouth into which the body is inserted, and may be shaped and configured so that it can be mounted on the body in only one orientation relative to the body.

The apparatus may include at least one non-return valve. The valve(s) may be arranged such that the flowable substance flowing in the tube(s) must pass also through the valve(s) before entering the mixing nozzle. The valve(s) may serve to restrict back-flow of substances in the tubes. In particular, the valve(s) may serve to limit mixing of substances at locations where such mixing would be undesirable, such as in the tubes or substance containers. Thus, for example, the valves may serve to restrict back-flow of a substance in an incorrect tube, e.g. a tube through which that substance is not intended to be ducted. The non-return valve may be a simple non-return valve, similar to those used in conjunction with bicycle tyres. A valve associated with a particular tube may be mounted proximate a downstream end of that tube.

The body of the apparatus is typically of moulded plastics construction. It may include two complementary, elongate body members which may be removably fastened, e.g. snap-lockingly fastened, to each other thereby to define between them the tubular passages and the cylindrical recess. One of the body members may include the hand-grip and lock means.

In a further aspect of the invention there is provided a service kit for replacement of parts of the dispensing apparatus as hereinbefore described, the kit including at least one resiliently deformable tube having an external diameter and a length appropriate for snug fitting of the tube in one of the tubular passages defined through the body of the apparatus.

The kit may further include a mixing nozzle, as hereinbefore described. It may further include spigot arrangements for use in the dispensing apparatus to support the tubes.

According to a further aspect of the invention there is provided a dispensing system for dispensing a plurality of flowable components, the system including a dispensing apparatus as described above, connected to containers holding the flowable components.

The flowable components may be those used for the formation of spray foams. The components may be those which are conventionally used for the formation of polyurethane foams.

In another aspect of the invention there is provided a method of regulating flow of at least one flowable substance through a hand-held dispensing apparatus, which includes the steps of:

ducting the substance through at least one resiliently deformable tube in the apparatus; and

pinching the tube by means of displaceable pinching means forming part of the apparatus, thereby selectively to restrict flow of the substance through the tube.

Preferably, the method is for regulating flow of a plurality of separate flowable substances or components (typically two), which are ducted through respective separate tubes. Pinching the tubes may then be simultaneous pinching of the tubes.

Pinching the tubes may be by rotating at least one camming surface, thereby to bring the surface to bear selectively against the tubes.

The method may be a method of regulating flow of flowable components used for the formation of spray foams, e.g. polyurethane foams, through a hand-held expanded foam dispensing gun.

The invention will now be described by way of non-limiting example, with reference to the accompanying diagrammatic drawings. In the drawings:

Figure 1 shows, schematically, a three-dimensional view of a dispensing apparatus according to the invention;

Figure 2 shows, schematically, an exploded three-dimensional view of the dispensing apparatus shown in Figure 1;

Figure 3 shows, schematically, a fragmentary sectional side elevation of a forward, nozzle end of the dispensing apparatus shown in Figures 1 and 2;

Figure 4 shows, schematically, a fragmentary three-dimensional view of a peristaltic valve system employed in the dispensing apparatus shown in Figures 1 and 2, the peristaltic valve system being in a tube-open configuration;

Figure 5 shows, schematically, a fragmentary three-dimensional view of the peristaltic valve system shown in Figure 4, but in which the system is in its tube-sealed configuration;

Figures 6 and 7 show, schematically, amplified three-dimensional views of the peristaltic valve system shown in Figures 4 and 5, illustrating, respectively, the configurations shown in Figures 4 and 5;

Figure 8 shows, schematically, a sectional rear view of the dispensing apparatus shown in Figure 1, taken at the line VIII-VIII in Figure 9 and showing the peristaltic valve system of the dispensing apparatus in its tube-sealed configuration;

Figure 9 shows, schematically, a side sectional elevation taken at the line IX-IX in Figure 8;

Figure 10 shows, schematically, a rear sectional view of the dispensing apparatus shown in Figure 1, taken at the line X-X in Figure 11, and showing the peristaltic valve system of the dispensing apparatus in a partially open configuration;

Figure 11 shows, schematically, a side sectional elevation taken at the line XI-XI in Figure 10;

Figure 12 shows, schematically, a rear sectional view of the dispensing apparatus shown in Figure 1, taken at the line XII-XII in Figure 13, and showing the peristaltic valve system of the dispensing apparatus in its tube-open configuration;

Figure 13 shows, schematically, a side sectional elevation taken at the line XIII-XIII in Figure 12; and

Figure 14 shows, schematically, a side view of a second embodiment of a dispensing apparatus according to the invention.

Referring to Figures 1 to 13, reference numeral 20 indicates generally a dispensing apparatus according to the invention. The dispensing apparatus 20 is suitable for use as an organic plastics expanded foam dispensing gun, e.g. for dispensing two separate flowable components which upon admixture with one another form an expanded foam such as polyurethane foam.

With particular reference to Figure 2 and Figures 8, 10 and 12 the apparatus 20 includes a body 22, two resiliently deformable tubes 24 (only one of which is shown in Figure 2), the tubes being snugly mounted inside the body 22 and extending longitudinally therein; and

selectively displaceable pinching means in the form of cam means 26, for selectively pinching the tubes, thereby selectively to restrict or facilitate the flow of the flowable components, e.g. the components for the formation of polyurethane foam, through the tubes.

The tubes 24 are of silicon rubber and are snugly mounted in tubular passages 28 defined in the body 22 of the apparatus. The snug fit of the tubes 24 in the passages 28 limits the risk of bursting of the tubes 24 caused by high pressures of components flowing through the tubes 24.

The cam means 26 includes a cylindrical barrel 30 rotatably mounted in a complementary cylindrical recess 32 formed in the body 22 of the apparatus 20.

In Figure 2, the cam means 26 and thus the barrel 30 are shown inverted from their usual operating orientation relative to the apparatus 20. This view shows clearly two hemi-cylindrical rebated regions 34 defined in the barrel 30 of the cam means 26. These rebated regions 34 accommodate the tubes 24, which pass through the regions 34 in the assembled apparatus (Figure 1). As is seen most clearly in Figure 12, the rebated regions 34 are each of a longer transverse width dimension w than the diameter d of each tube 24 in its substantially uncompressed state. This difference allows for lateral distortion and deformation of the tubes 24 in the rebated regions 34 of the barrel 30 during pinching of the tubes, discussed further below.

Referring again to Figure 2 and the cam means 26, basal surfaces 36 of the rebated regions 34 form camming surfaces of the cam means 26. These camming surfaces 36 bear upon the tubes 24 upon rotation of the barrel 30 in the assembled apparatus, thereby progressively pinching the tubes 24. This progressive camming action is illustrated in Figures 8 to 13, which show progressive rotation of the barrel 30 and hence the camming surfaces 36. The rotation progresses from a tube-sealed configuration (Figures 8 and 9) in which the camming surfaces 36 pinch the tubes 24 to such an extent that the tubes are sealed closed, through to a tube-open configuration (Figures 12 and 13) at which the camming surfaces 36 lie flush with upper edges of the tubes 24. In this configuration, flow of the flowable components through the tubes 24 (indicated by arrows 38) is least restricted. Figures 9, 11 and 13 illustrate a slight chamfering of leading and trailing edges of the

camming surfaces 36. This chamfering limits the risk of damage to the tubes 24 which might otherwise be inflicted by sharp edges on the camming surfaces 36.

With reference to Figures 11 and 9, it can be seen that the cam means 26 is arranged such that flow of the flowable components in the tubes 24 in the direction of the arrows 38 (Figure 11) tends to rotate the cam means 26 further towards the tube-sealed configuration shown in Figure 9, rather towards the tube-open configuration shown in Figure 13. The origin of the phrase "peristaltic valve system" to describe the combination of the cam means 26 acting upon the tubes 24, is also clear from these Figures, which show similarities with the principle of operation of peristaltic pumps (in which camming surfaces also operate to pinch flexible tubes).

The apparatus 20 further includes lever means in the form of a trigger 40 connected to the cam means 26, for rotating the cam means 26, thereby to pivot the camming surfaces 36 away from the tubes to facilitate flow of the flowable components through the tubes; i.e. to dispense the flowable components according to demand.

As shown in Figures 9 and 11, and described above, the cam means 26 and the trigger 40 are normally biased into the tube-sealed configuration by internal pressure exerted by the flowable components against the walls of the tubes. This bias towards the tube-sealed configuration is augmented by lock means in the form of an elongate brace member 42 pivotally mounted on a hand-grip 44 of the apparatus 20. The brace member 42 is biased, by an axial spring (not shown) acting at its pivot point with the hand-grip 44, towards the trigger 40. The member 42 bears upon a rear edge of the trigger 40, urging it towards the tube-sealed configuration, and the member eventually toggles over-centre to a position (see Figure 9) at which the trigger 40 is locked against travel towards the hand-grip 44, so that operation of the cam means 26 is checked and the risk of accidental discharge of the flowable components from the tubes 24 is diminished. In use of the apparatus 20, to release the lock means, the brace member 42 is lifted with the fingers of the user, against the bias of its axial spring, and the trigger 40 is pulled towards the hand-grip 44 (see, for example, Figure 11).

As explained, the apparatu. 20 includes a hand ; 44. The apparatus is thus in the form of a "gun" configured for gripping and operation b single hand of a user.

The apparatus 20 has hose connection means ; the form of serrated spigots extending from a rear end of the apparatus 20. The c nection means 46 are configured for connecting the respective tubes 24 to hoses of tainers holding the respective flowable components to be dispensed by the apparatus 2 s explained, in certain embodiments of the invention, these components are compon required for the formation of sprayed expanded foams e.g. components typically used f the formation of polyurethane foams.

The apparatus 20 further includes a static mixer (Figure 2) disposed near a front end of the apparatus 20, for mixing the flowable com ents. The components are discharged from the tubes 24 into a mixing chamber formed a mixing nozzle 50 which snap-lockingly fits over the static mixer 48 and a front end o he body 22 of the apparatus 20. The mechanism of snap-locking engagement of th mixing nozzle 50 with the body 22 is illustrated in Figure 3. The body 22 has re able clip means 52 (Figures 1 and 3) engageable with complementary recesses 54 i e mixing nozzle 50. As will be seen in Figure 2, the mixing nozzle 50 has an elonga mouth into which the body 22 is snap-lockingly inserted. This feature, in combinatio th the location of the recesses 54 in the mixing nozzle 50, permits the mixing nozzle t e mounted on the body 22 in only one orientation relative to the body.

The apparatus 20 is predominantly of injection- ulded plastics construction. The body 22 is formed from two complementary elongate bo members 56, 58. An upper body member 56 is shown inverted in Figure 2 to illustrate n lded recesses which, in combination with opposing recesses in a lower body member form the tubular passages 28 and the cylindrical recess 32 for the barrel 30 of the n means 26. The body members 56, 58 include engaging formations (not shown) to fa ie snap-locking fastening of the members to one another. The snap-locking engage of the members to one another enables disengagement of the members from each o if required to replace wo -out parts such as worn-out tubes 24. Wear parts o n may become blocked with use and are likely to require intermittent replacemen the tubes 24, can be provided to users of the apparatus 20 as part of a service ki own). Such service kit may additionally

include components of the apparatus 20 such as the mixing nozzle 50, front and rear spigot arrangements (discussed further below), etc.

Front and rear ends of the body members 56, 58 define transverse moulded slots 60 (Figure 2) in which front and rear spigot arrangements 62 are received. The spigot arrangements 62 hold inwardly facing, serrated spigots for push-fitting engagement with the tubes 24.

Referring now to Figure 14, reference numeral 120 indicates generally a further embodiment of a dispensing apparatus according to the invention. The apparatus 120 is similar to the apparatus 20, and accordingly, like reference numerals have been used to indicate the same or similar features of the apparatuses 120, 20, unless otherwise indicated. The apparatus 120 differs from the apparatus 20 in that it has a pinching member 122 instead of the cam means 26 of the dispensing apparatus 20. The pinching member 122 is pivotally mounted on the trigger 40, which in turn is normally biased by means of a spring (not shown) away from the hand-grip 44. A curved working face 124 of the pinching member 122 is thus normally urged upwardly against the tubes 24, to bear upon and pinch the tubes 24 into a tube-sealed configuration. During operation of the dispensing apparatus 120, the trigger 40 is squeezed towards the hand-grip 44, against the bias of the spring. The working face 124 of the pinching member 122 is thus drawn away from the tube 24, permitting the flowable components to flow through the tubes 24 and to be dispensed from the apparatus 120. A static mixer and a mixing nozzle form part of the apparatus 120, but are not shown in Figure 14.

The applicant believes that the dispensing apparatuses as illustrated and described have several advantages over conventional dispensing apparatuses in the field, and particularly over conventional expanded foam dispensing guns e.g. polyurethane chemical flow guns. Examples of these advantages include the following:

1. The peristaltic valve system diminishes the risk of contamination between components due to pressure variations in component storage containers resulting in reverse flows.

2. Low cost reconditioning of the apparatuses is facilitated, as they may be reconditioned simply by replacement of the resiliently deformable tubes.

3. The number of parts from which the dispensing apparatuses are manufactured is reduced by comparison with conventional dispensing apparatuses. Furthermore, the dispensing apparatus 20 is manufactured from moulded plastics parts. Thus, quick and simple manufacturing and assembly is facilitated.

4. Fitting of the mixing nozzle, housing the static mixer, can only be done so that the dispensing apparatus is functional. Fitting may also be performed easily in adverse conditions, e.g. in mining situations. These advantages are attributable to the fact that the mixing nozzle is shaped and configured so that it can be mounted on the body of the apparatus in only one orientation relative to the body.

5. For the dispensing apparatus 20, the design and configuration of the cam means 26 and its principle of operation in the peristaltic valve system is such that pressure exerted by the components flowing through the tubes assists in sealing the tubes.

6. Construction of the dispensing apparatuses as illustrated and described is economical by comparison with conventional apparatuses.

7. Blocking of the present dispensing apparatuses can more easily be addressed than in conventional dispensing apparatuses. Unblocking of the present apparatus can, for example, simply entail replacement of the resiliently deformable tubes.

8. It is an advantage of the dispensing apparatus 20, that snug mounting of the tubes in the tubular passages defined in the body of the apparatus 20 limits the risks of bursting of the tubes under high internal pressures.

DATED THIS 29TH DAY OF MARCH 1999

HAHN & HAHN INC.
Agent for Applicant

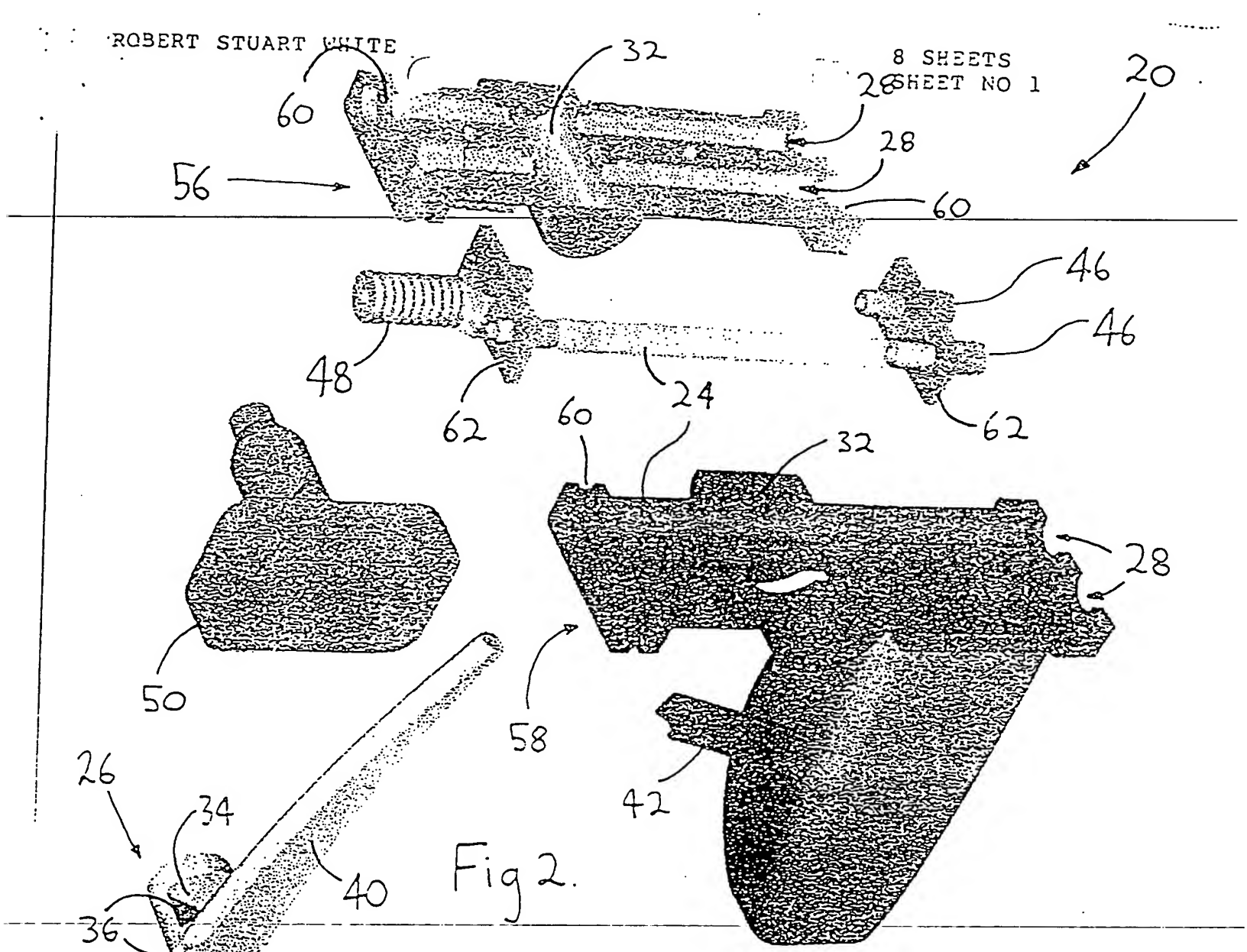
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Fig 2.

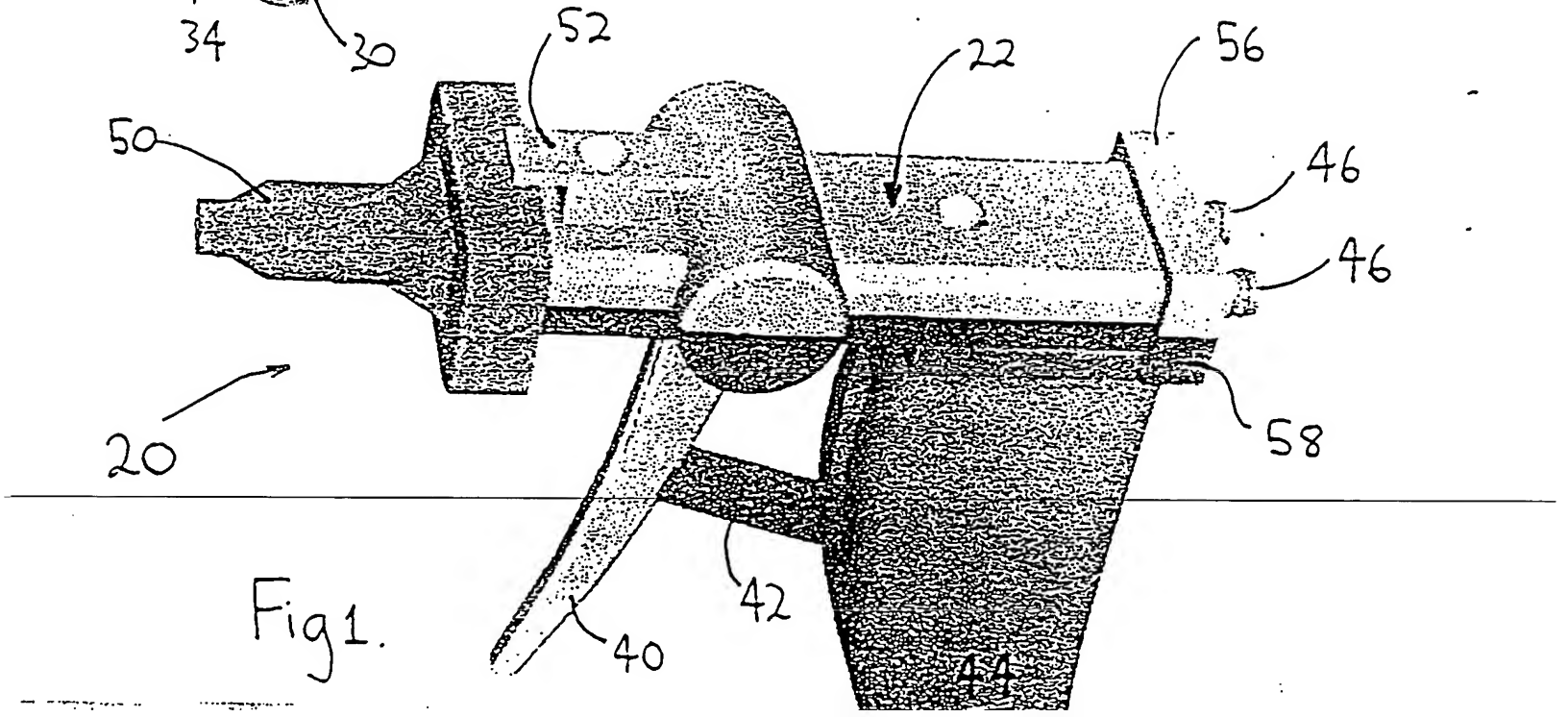
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Fig 1.

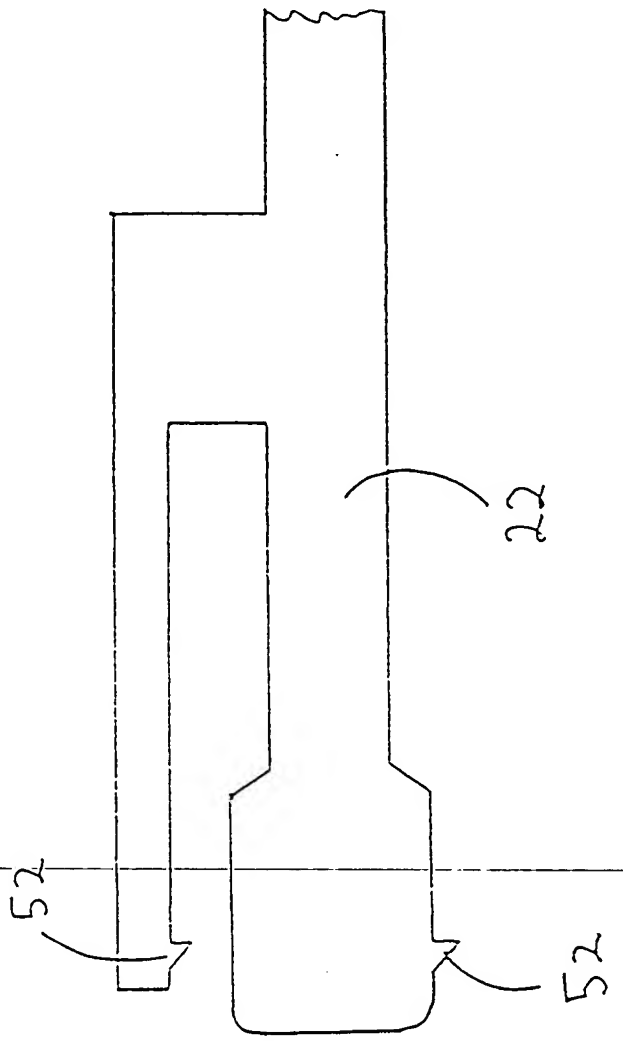
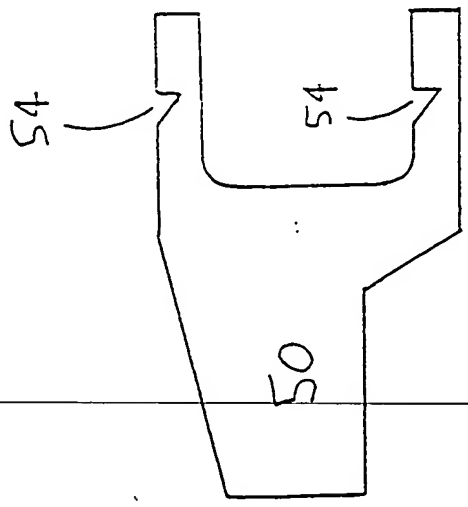


Fig 3.



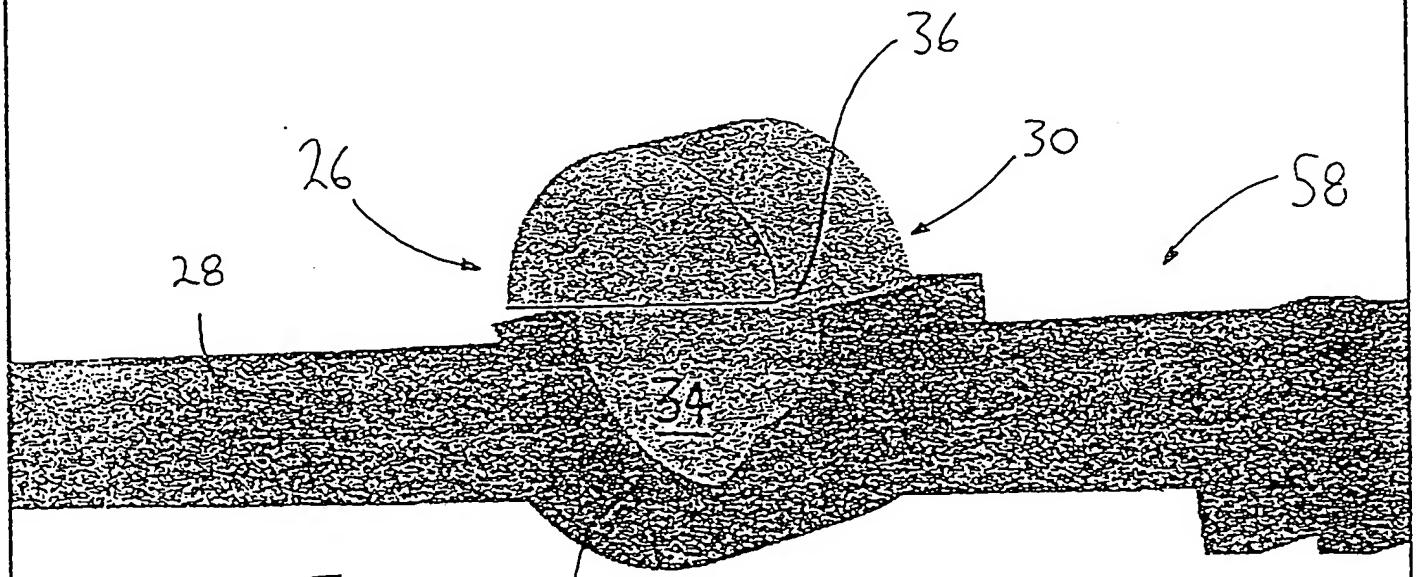


Fig 4.

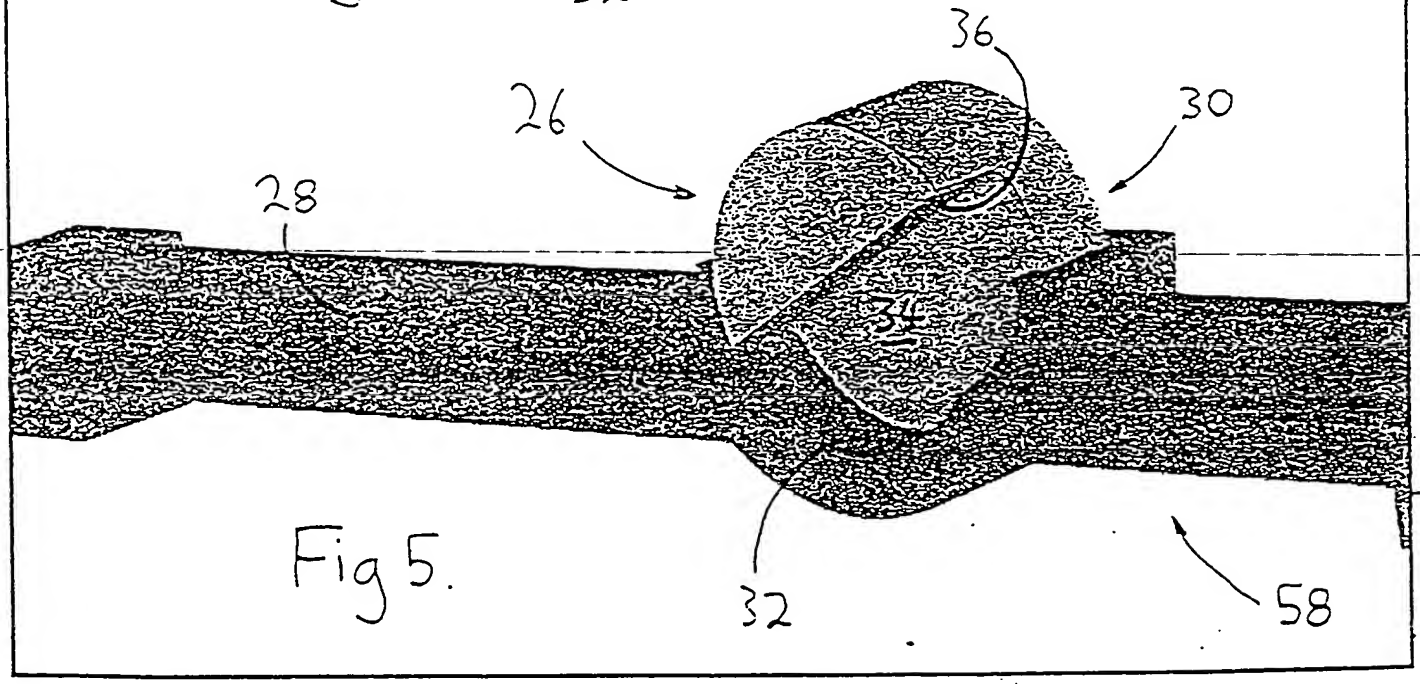


Fig 5.

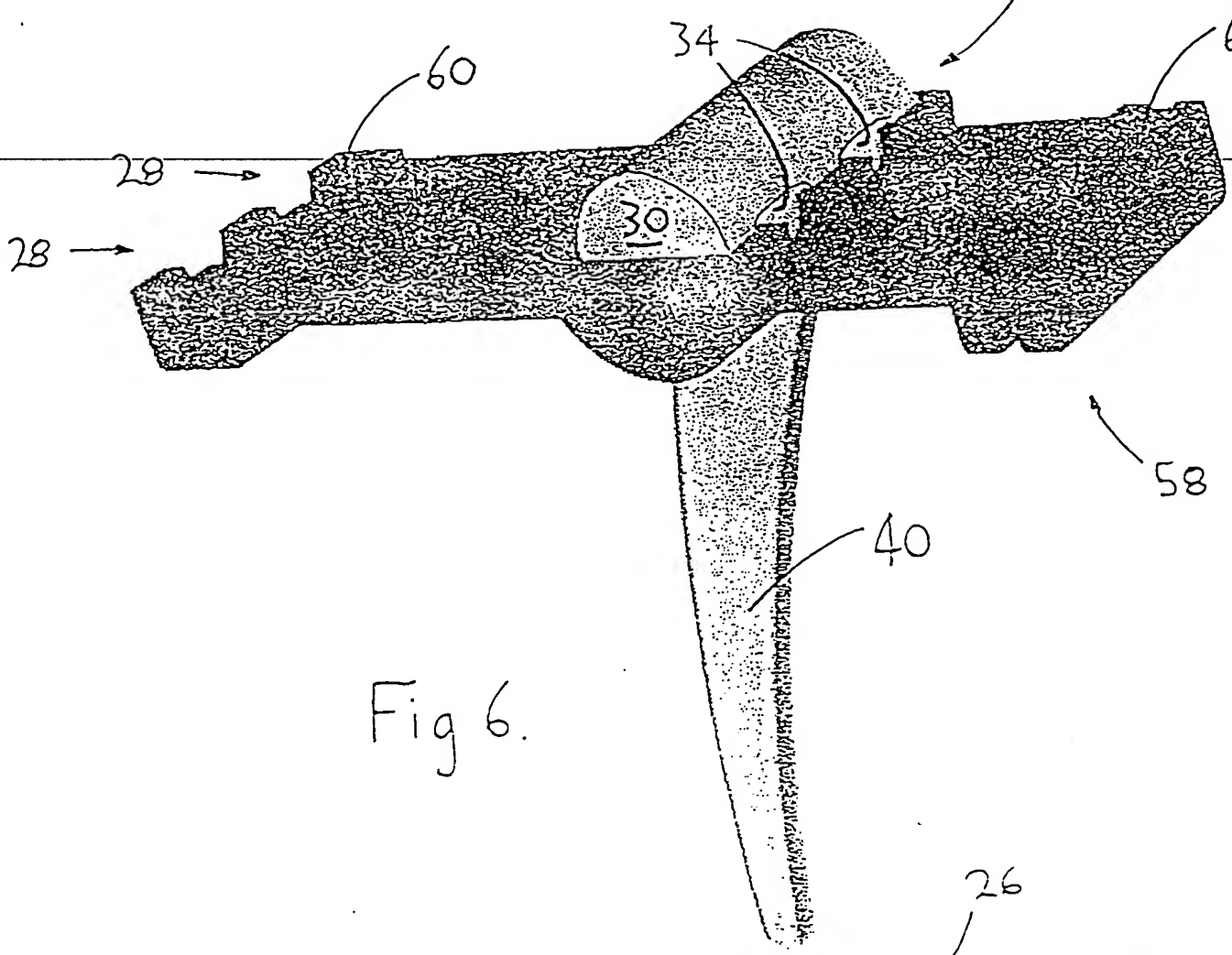


Fig 6.

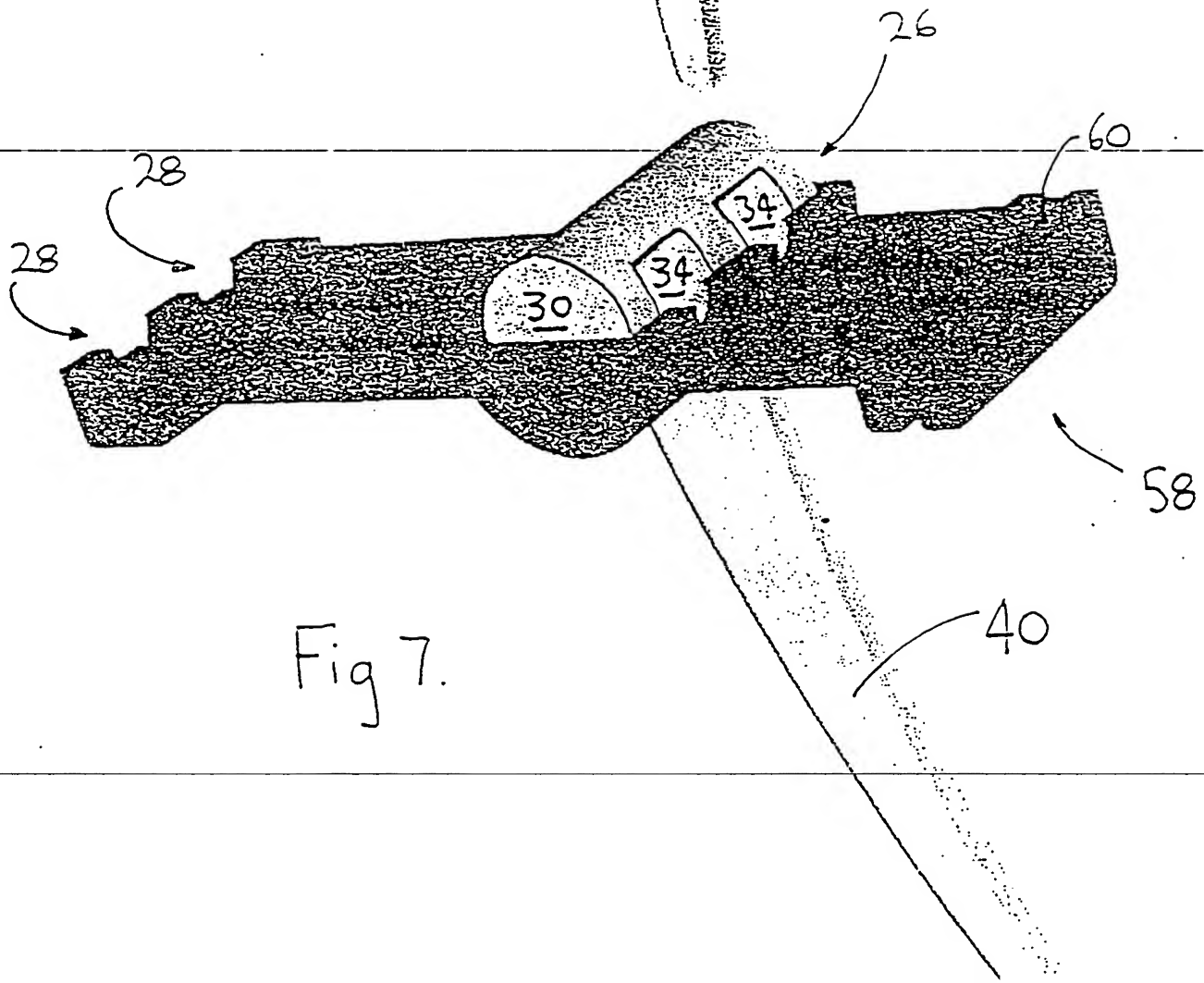


Fig 7.

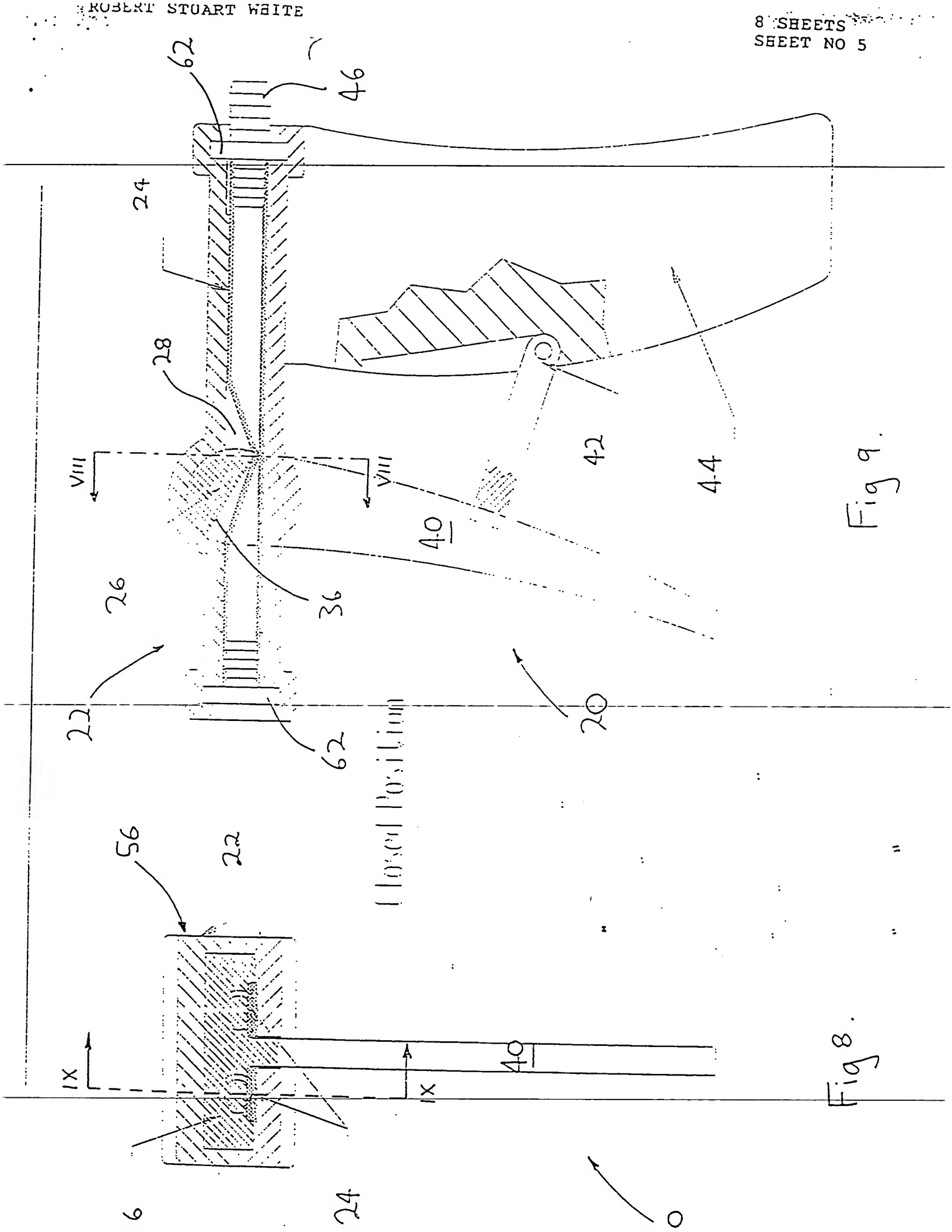
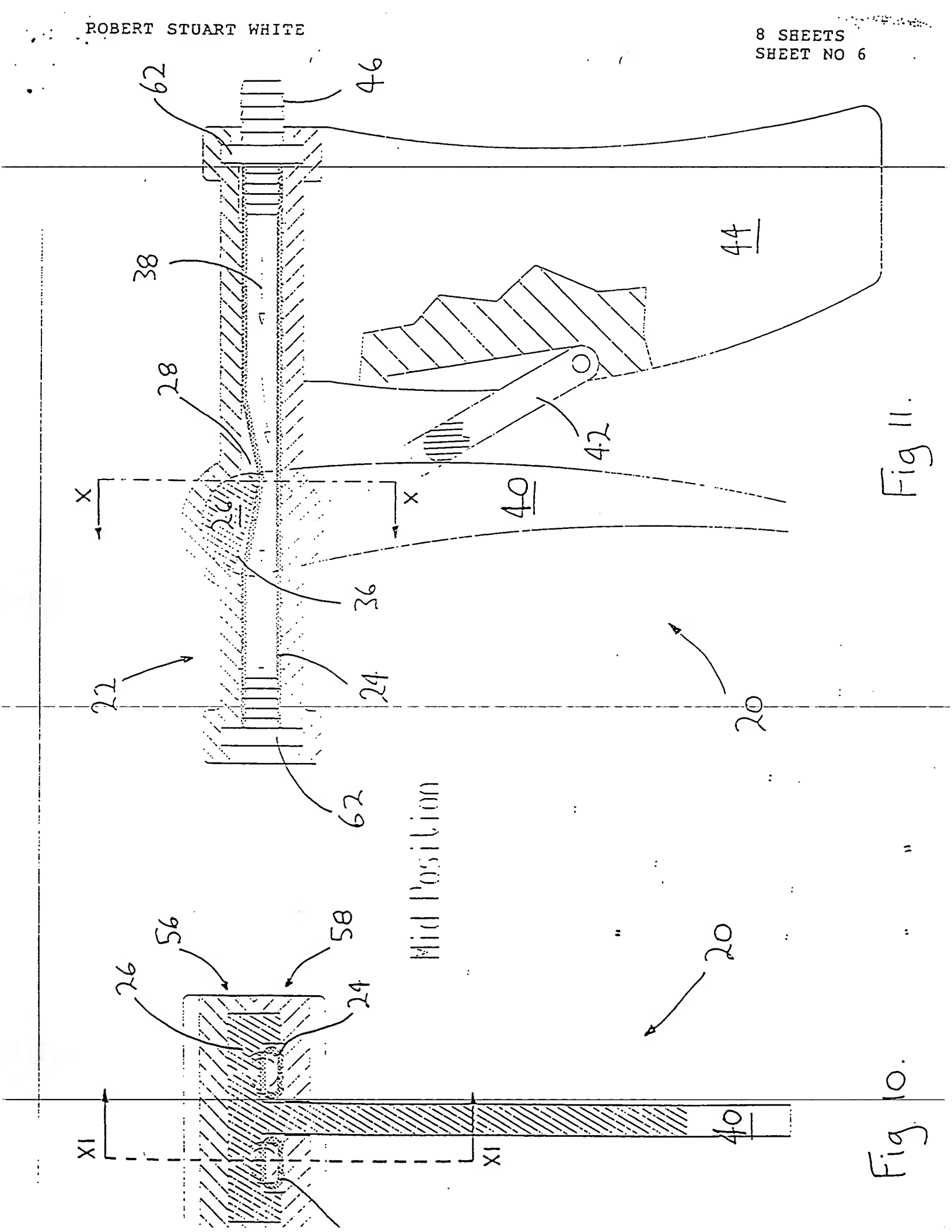


Fig 9.

Fig 8.


62
46
38
28
44
42
X
X
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36
22
24
20
62

Fig 11.

Mid Position
56
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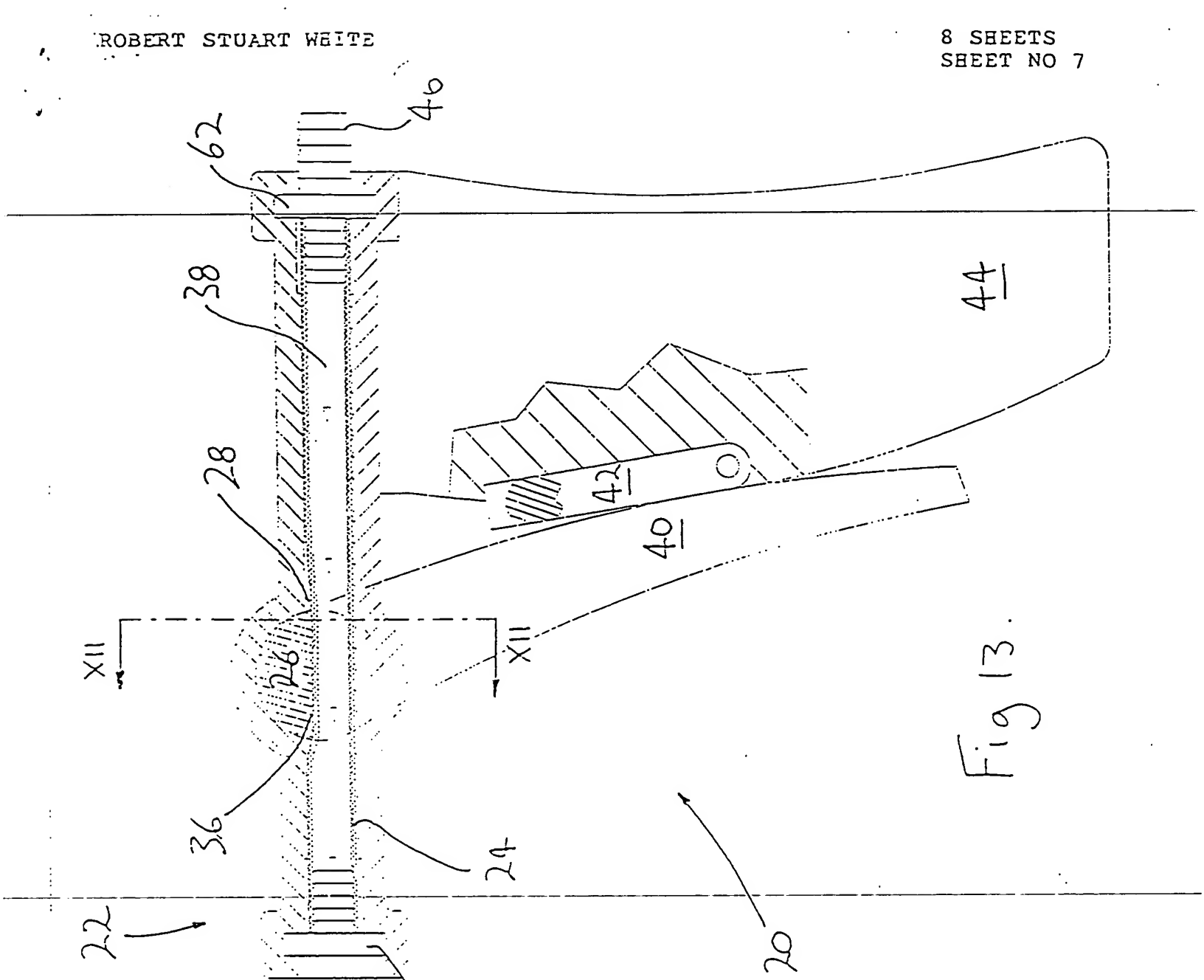
26
24
20
X1
X1
40

Fig 10.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XII
XII
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36
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Fig 13.

Open Position
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34
26
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XIII
XIII

Fig 12.

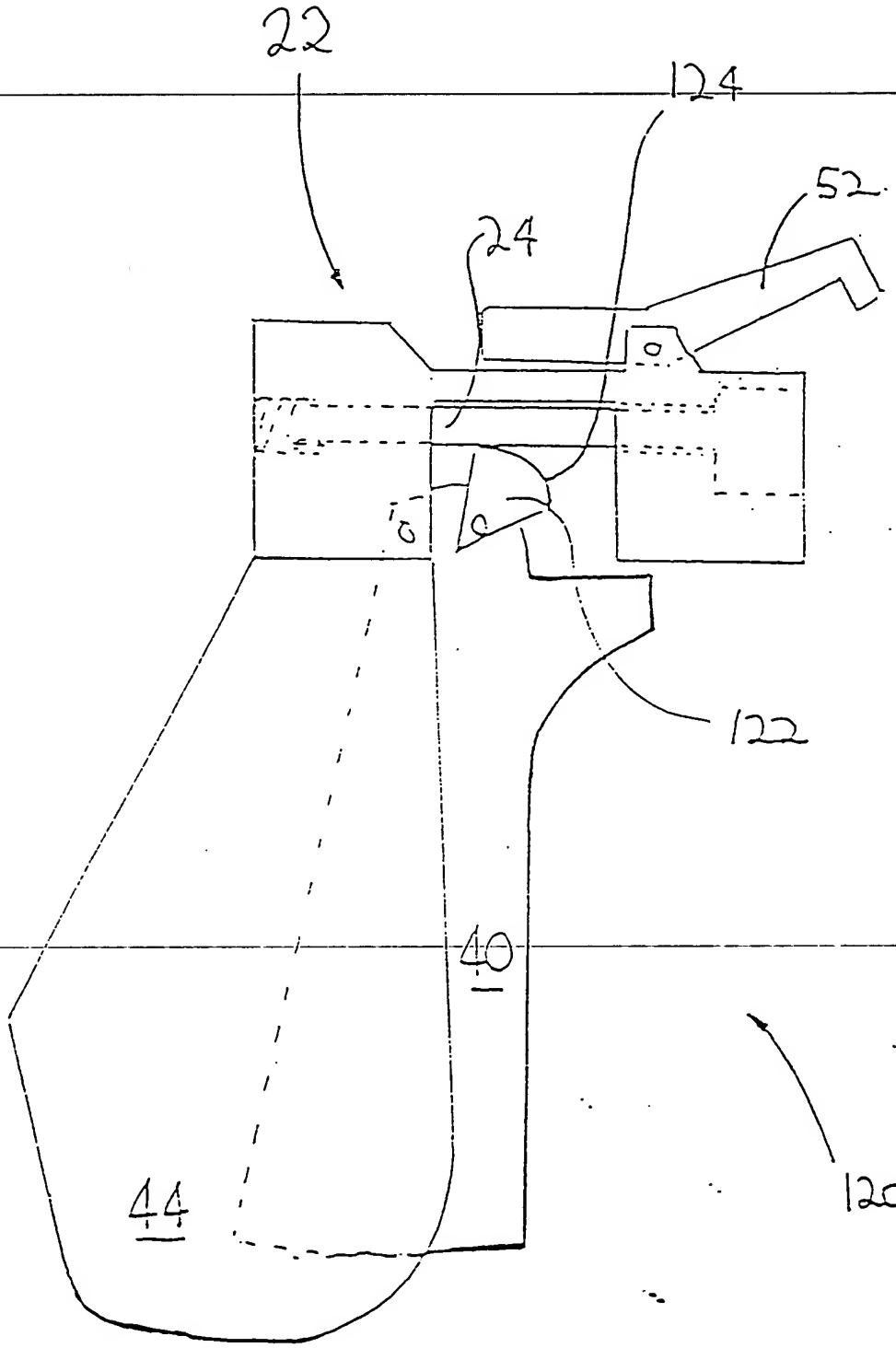

Fig 14.